EDX Plots for SIRIUS SDARS Radios in Raleigh, NC Market

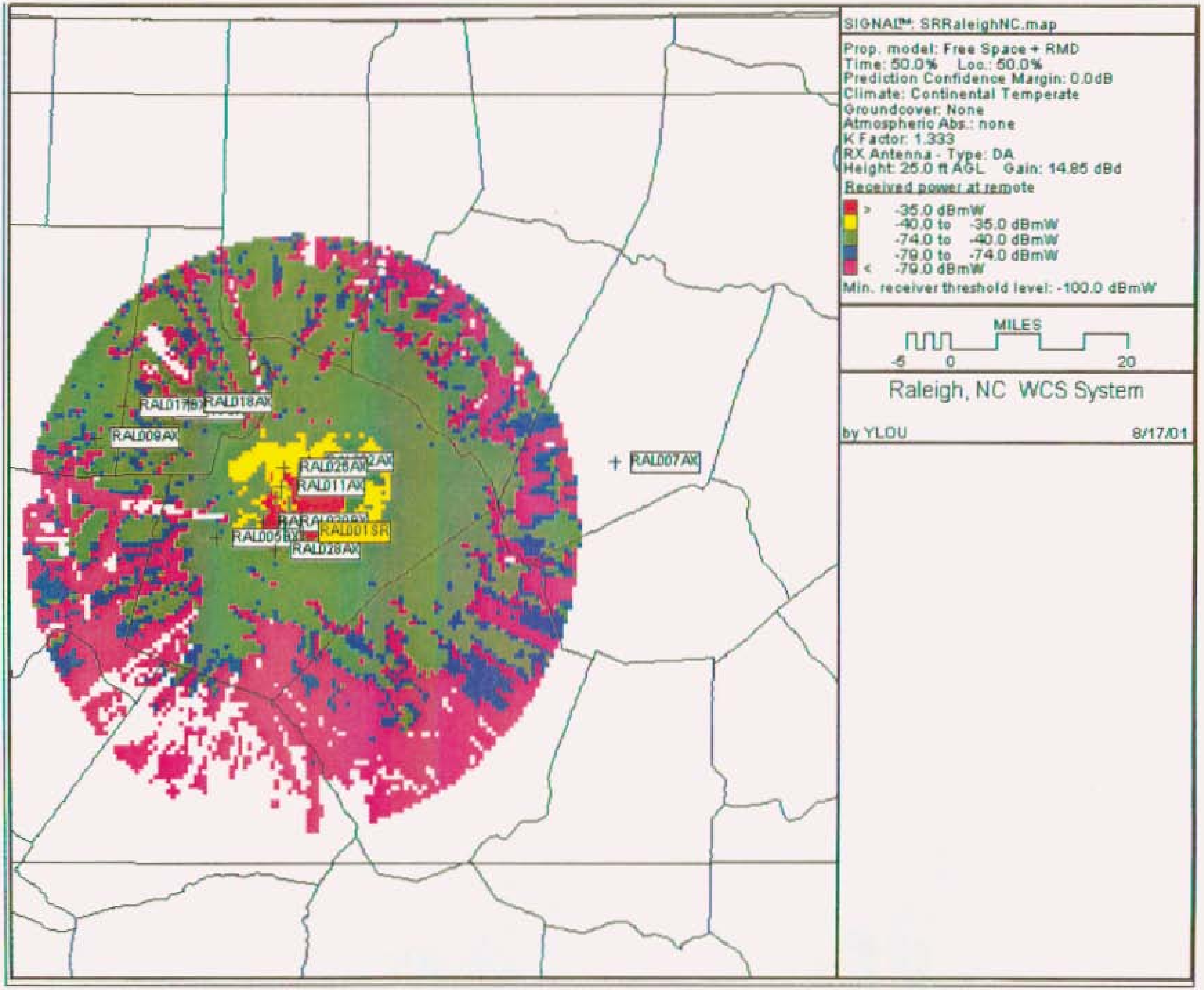
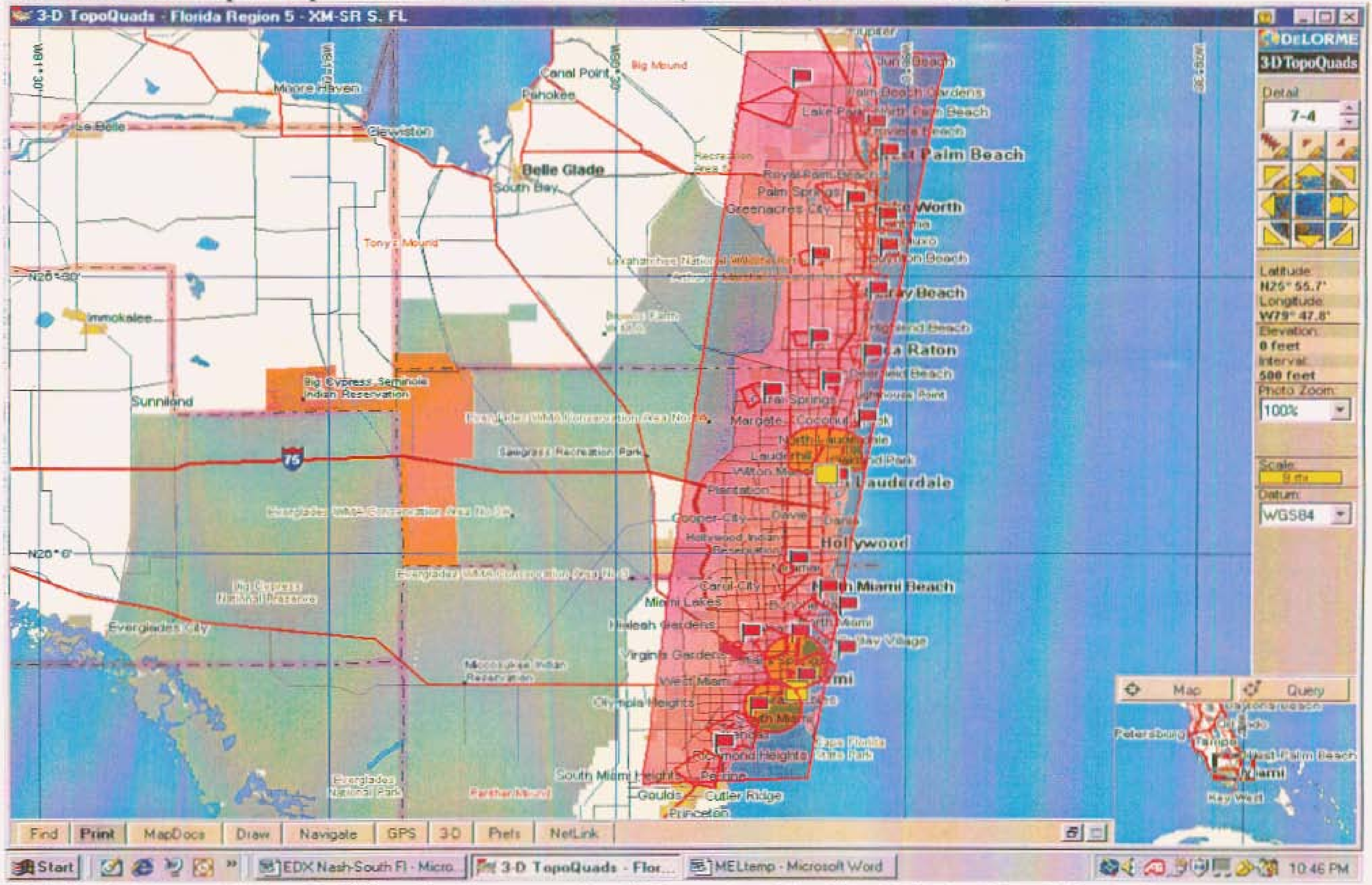


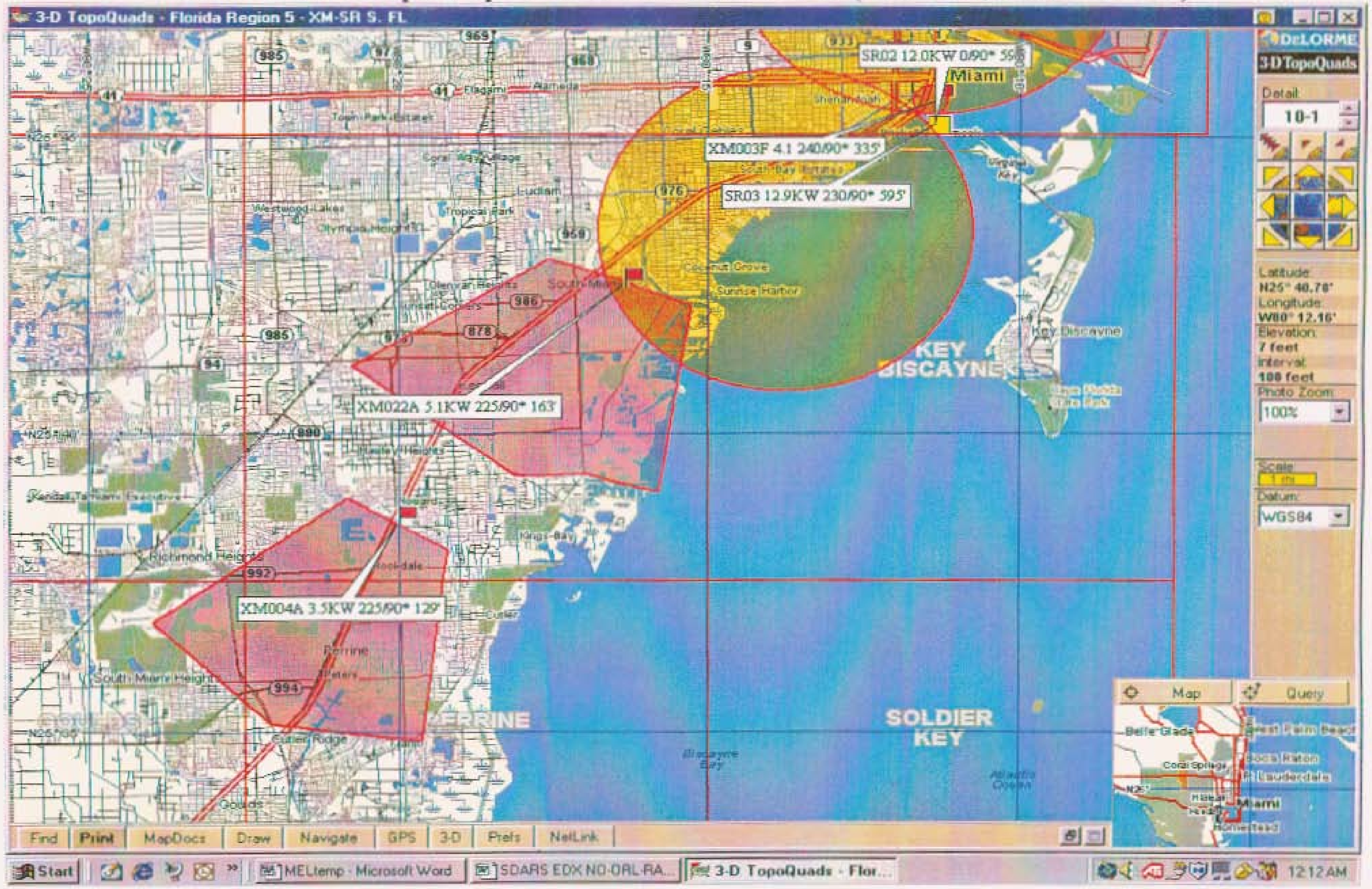
Exhibit 1.M
S. Florida

South Florida Topo Map - SDARS Exlcusion Zones (XM=Red, Sirius=Yellow)

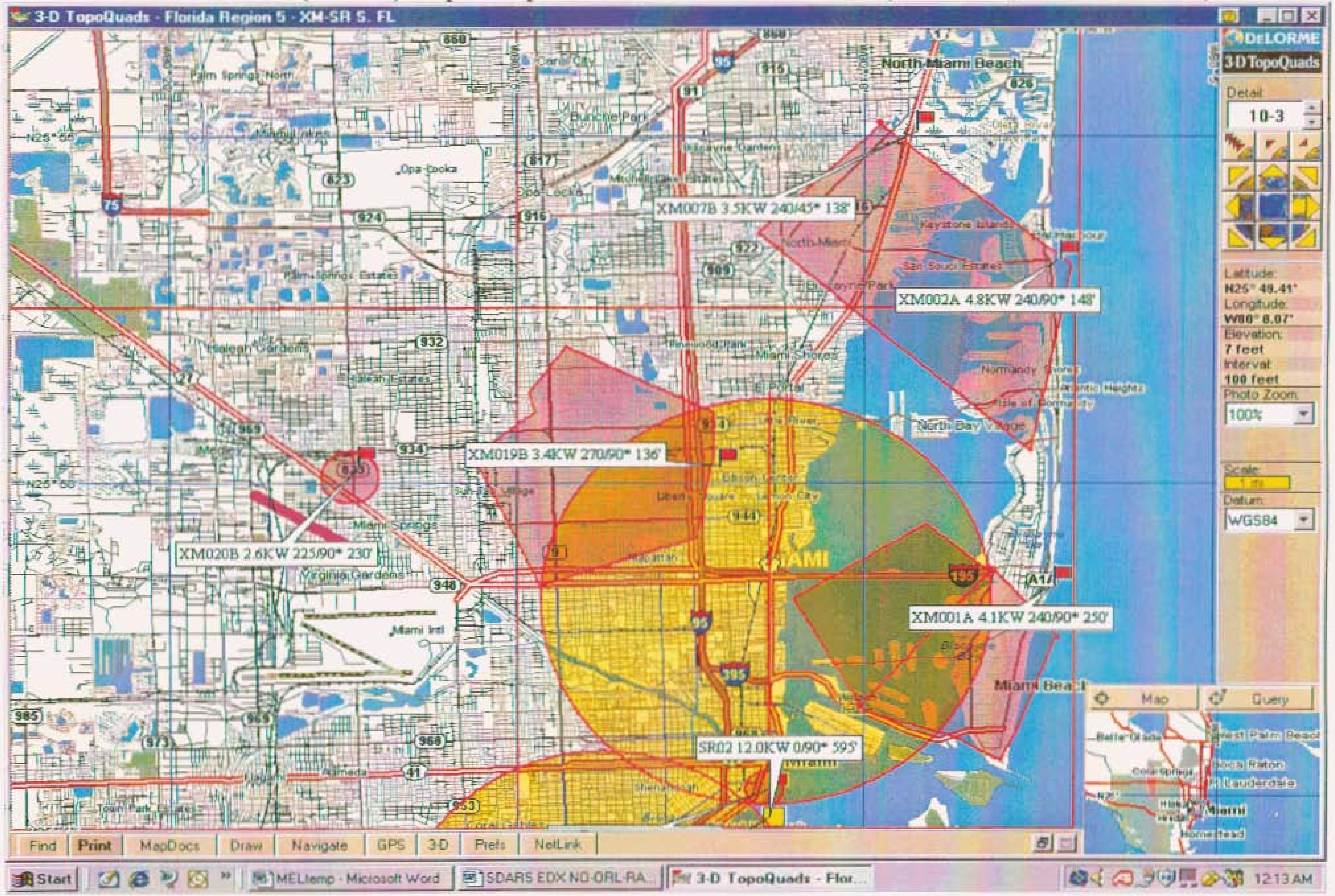


XM Definition of Miami. 100 miles from north of Homestead to North Palm Beach including: Miami, Ft. Lauderdale, Deerfield Beach, Boca Raton, Delray Beach, Lake Worth, Palm Beach

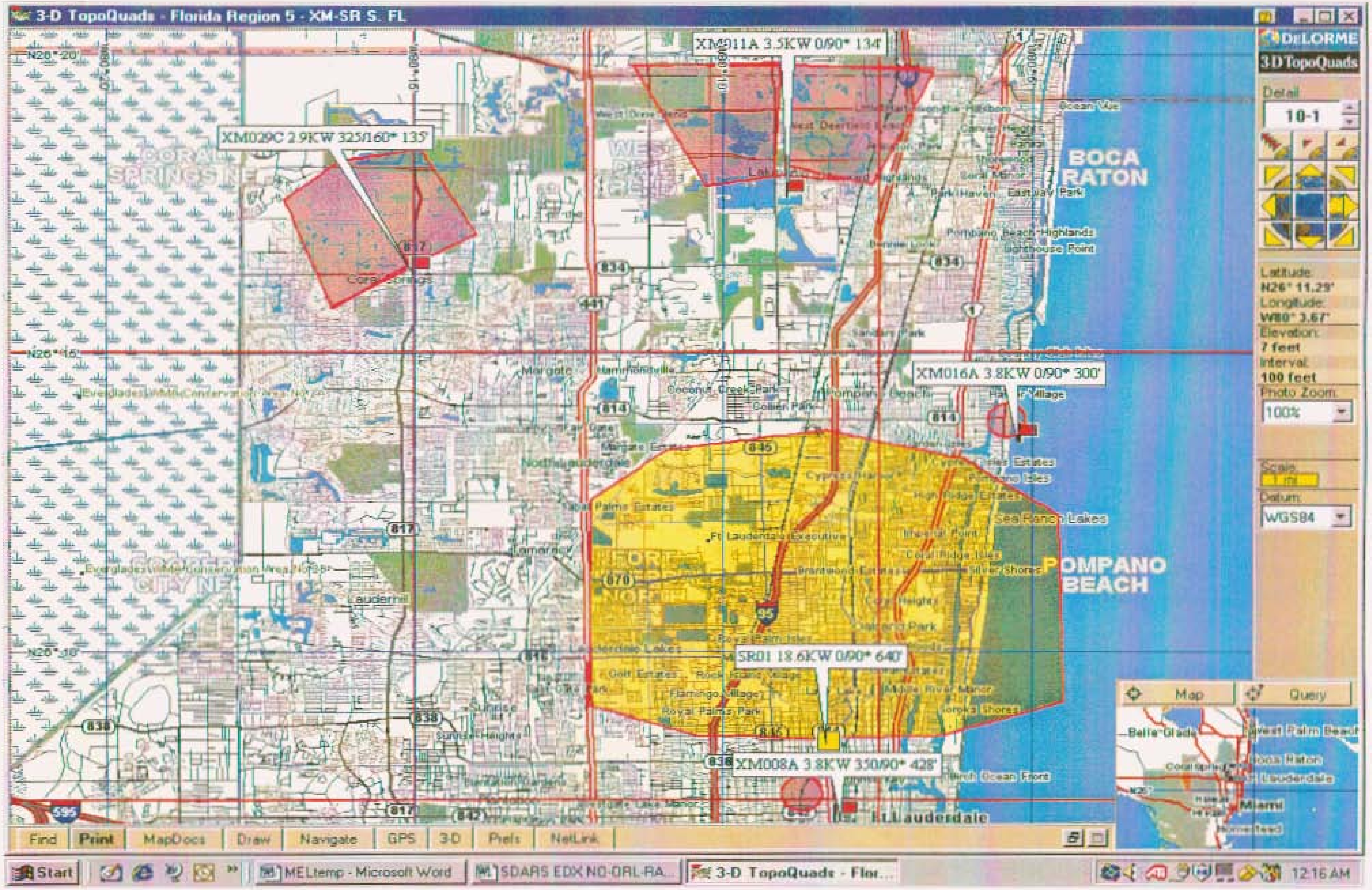
South Florida Topo Map - SDARS Exlcusion Zones (XM=Red, Sirius=Yellow)



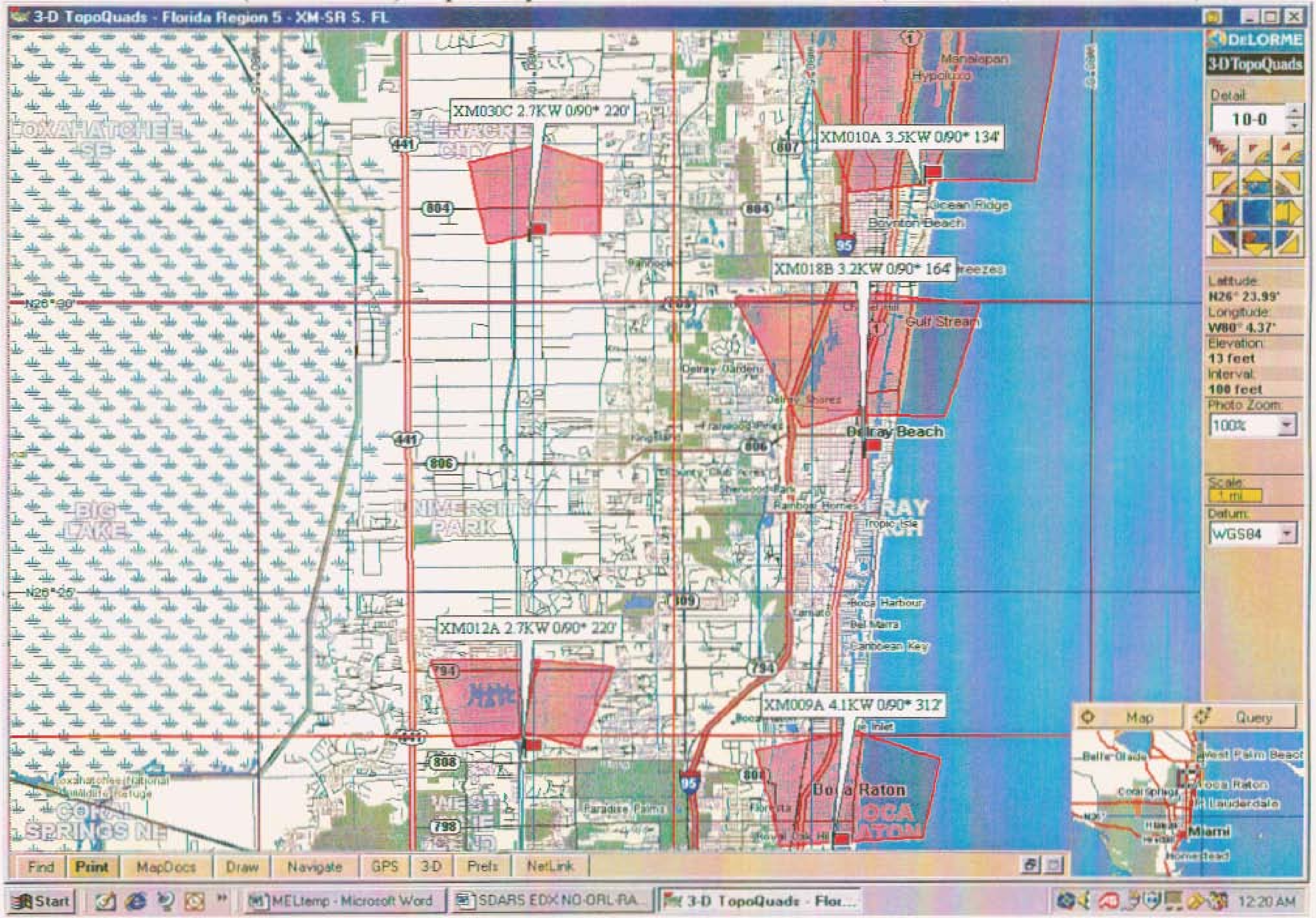
South Florida (Miami) Topo Map - SDARS Exlcusion Zones (XM=Red, Sirius=Yellow)



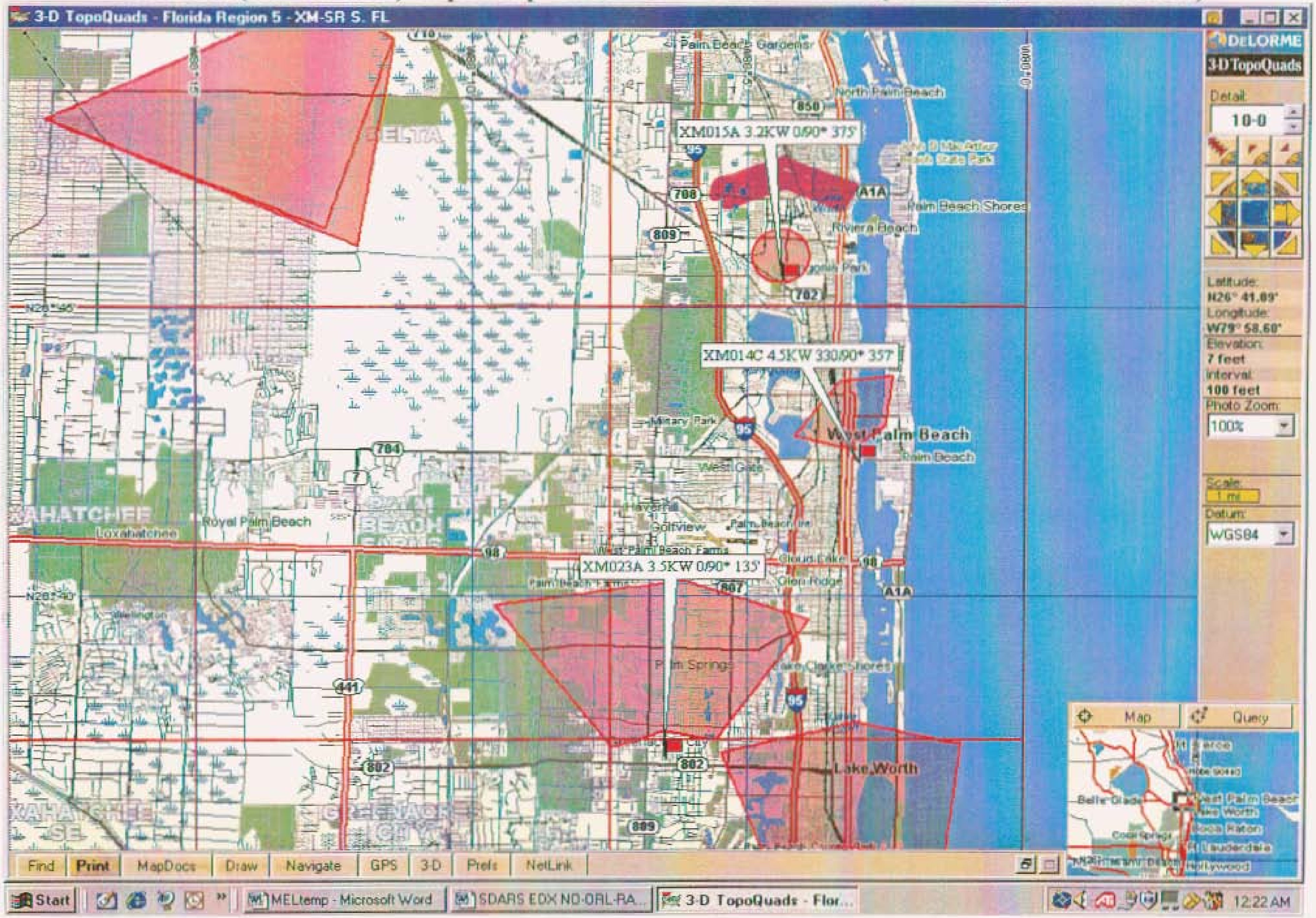
S. Florida (Ft. L., Deerfield Beach) Topo Map - SDARS Exlcusion Zones (XM=Red, Sirius=Yellow)



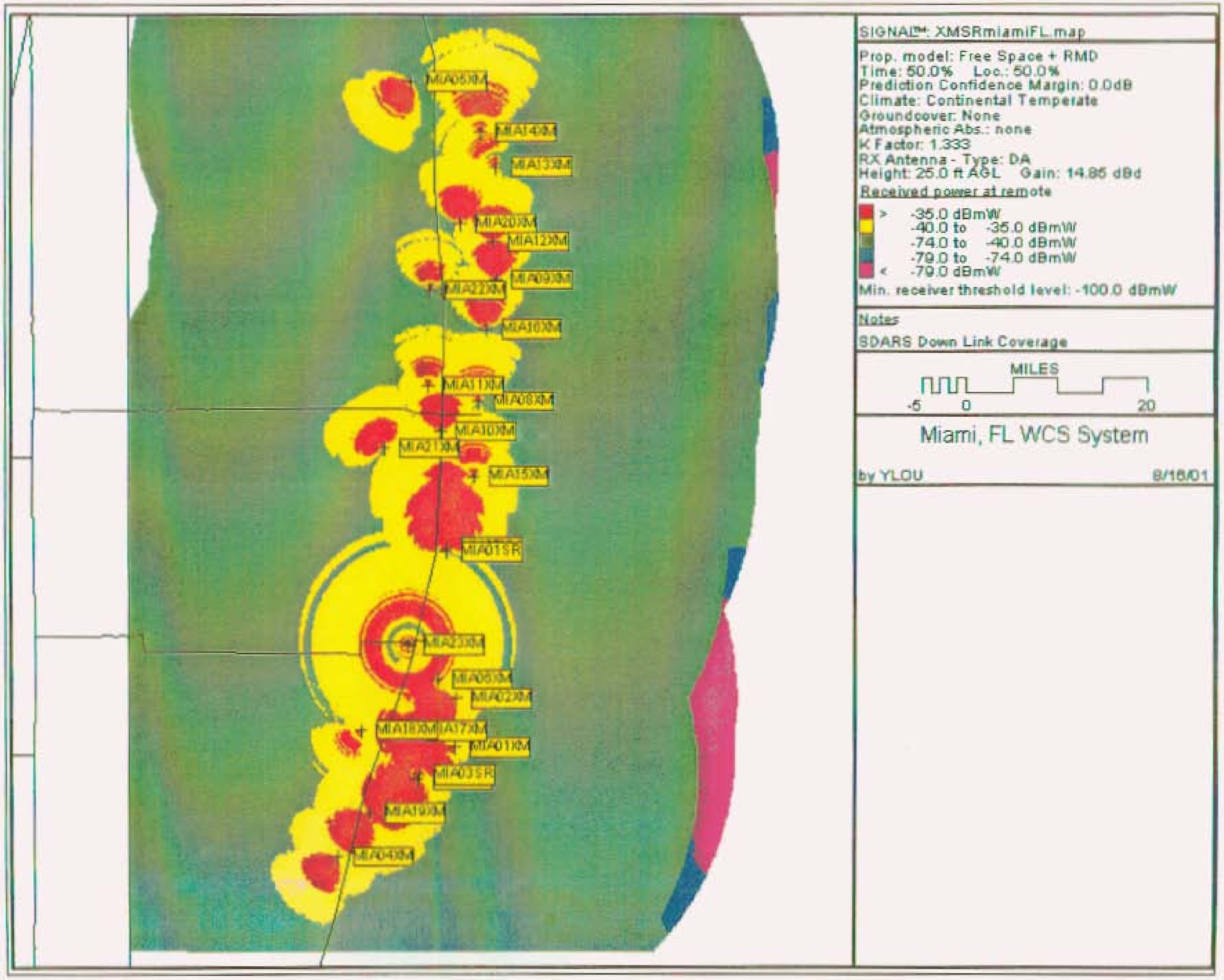
S. Florida (Boca Raton) Topo Map - SDARS Exlcusion Zones (XM=Red, Sirius=Yellow)



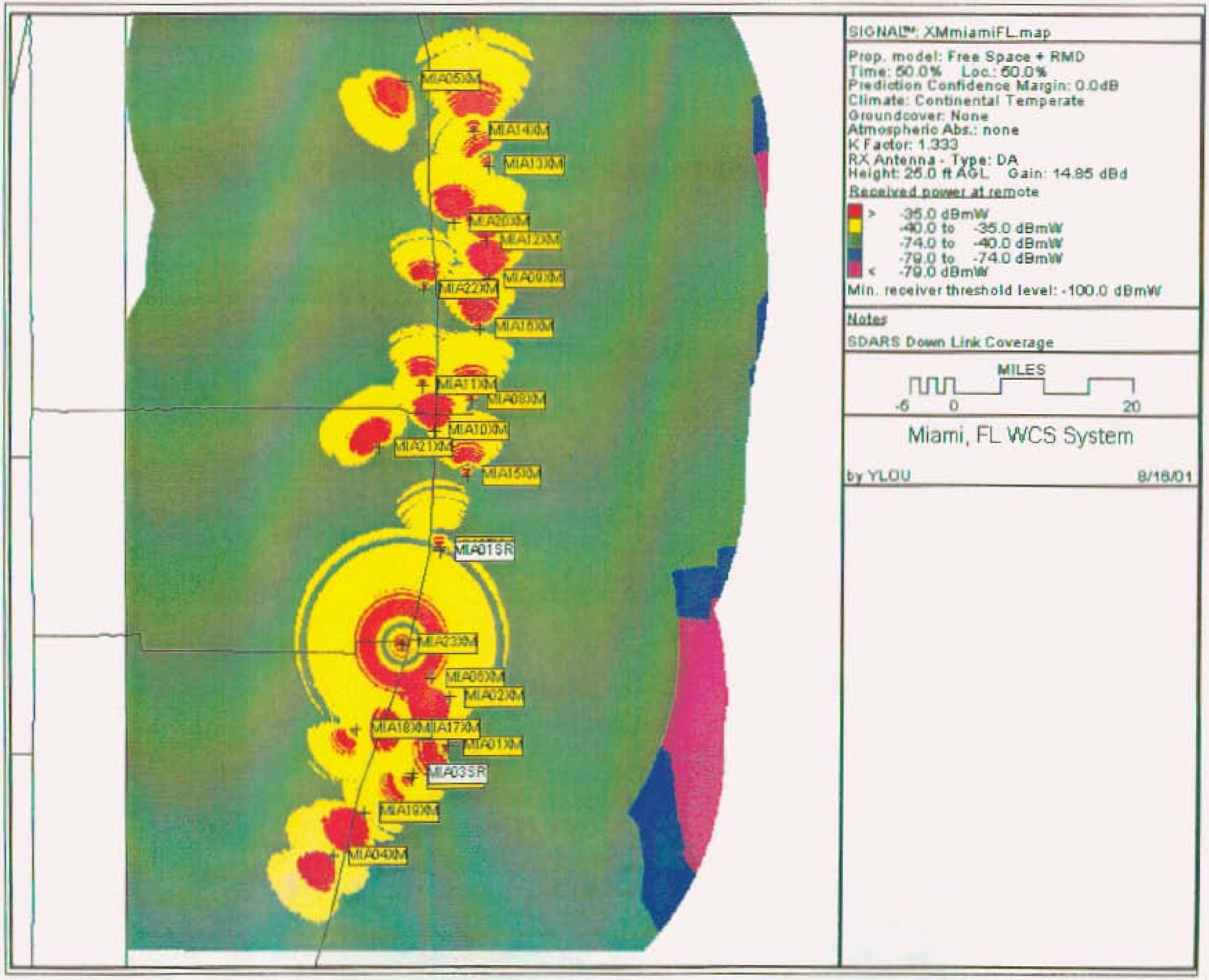
S. Florida (Palm Beach) Topo Map - SDARS Exlcusion Zones (XM=Red, Sirius=Yellow)



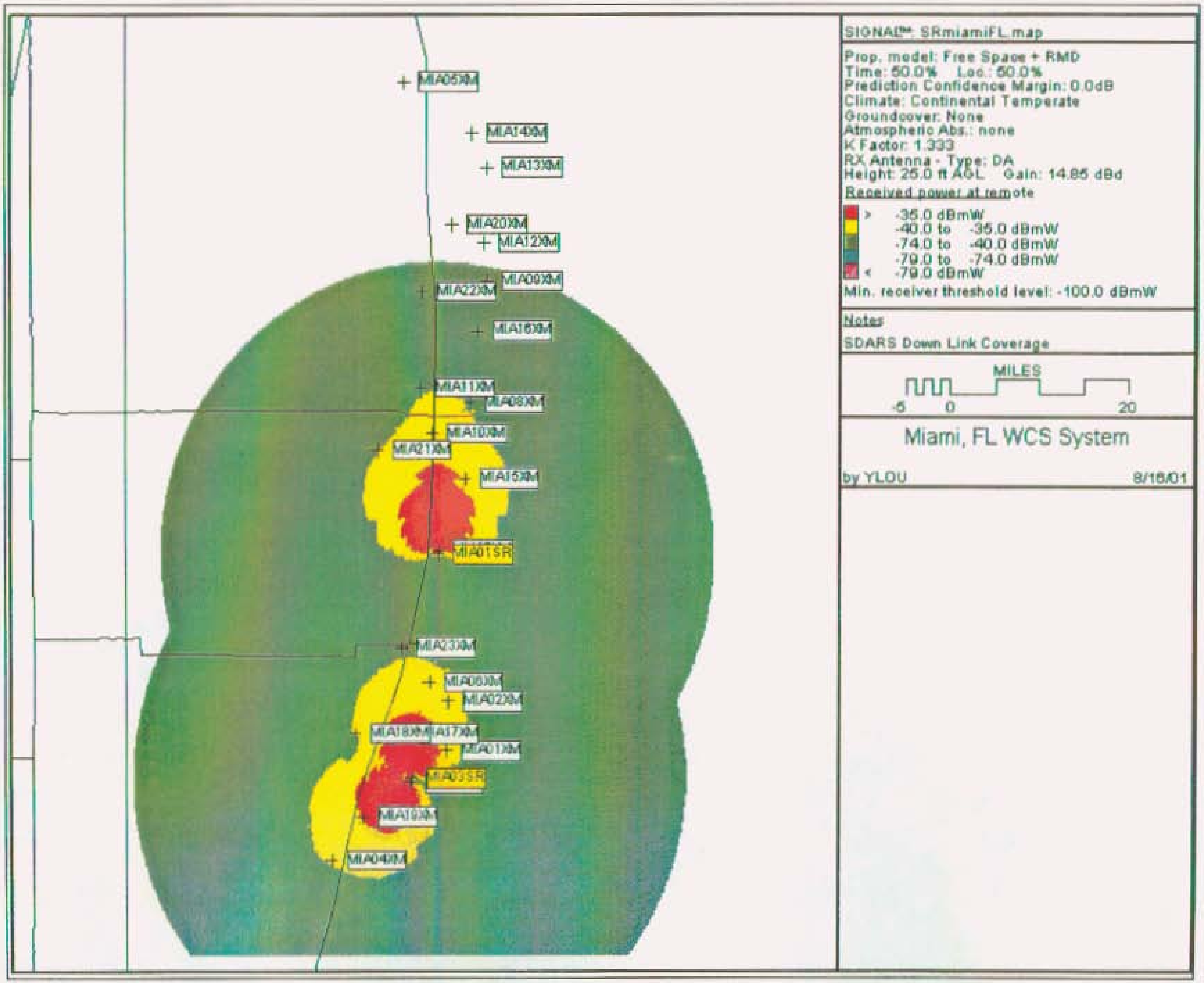
EDX Plots for Both XM and SIRIUS SDARS Radios in Miami, FL Market



EDX Plots for XM SDARS Radios in Miami, FL Market



EDX Plots for SIRIUS SDARS Radios in Miami, FL Market



ATTACHMENT C

Technical Analysis of the Potential for Interference from DARS Terrestrial Repeaters to WCS and MMDS/ITFS Services.

Technical Analysis of the Potential for Interference From DARS Terrestrial Repeaters to WCS and MMDS/ITFS Services

George W. Harter, Director of Broadband Wireless Engineering for MSI

This analysis has been prepared on behalf of The Wireless Communications Association International, Inc. ("WCA") in response to issues raised by XM Radio, Inc. ("XM") and Sirius Satellite Radio Inc. ("Sirius") with regards to the potential for interference from DARS terrestrial repeaters to existing and planned WCS and MMDS/ITFS services. More specifically, this analysis demonstrates that substantial interference to WCS and MMDS/ITFS operations will result unless the Commission adopts WCA's proposal to limit the EIRP of terrestrial DARS stations as it has limited the EIRP of terrestrial WCS – to 400 watts/MHz.

(1) Restatement of XM and Sirius operating parameters.

As one reviews the record in IB Docket No. 95-91 and Gen. Docket No. 90-357, it is evident that terrestrial DARS repeaters have evolved from the low-power "gap-fillers" initially envisioned by the Commission to high-power wide-area broadcast facilities that will be the primary vehicle for delivering DARS programming in major metropolitan areas. Therefore, as a preliminary matter, it is necessary to establish as a baseline the operating parameters that are currently being proposed by XM and Sirius. Based on statements made by XM and Sirius in their Supplemental Comments filed in December 1999 and January 2000 and their Reply Comments filed in March of 2000, the following operational characteristics have been established by XM and Sirius and are presented here for reference in the remainder of this analysis.

[illegible]	[illegible]	[illegible]
Max Power Limit	None[1]	None
Operating Power Levels per Carrier	3 – 20 KWatts (High) 1 – 2.5 KWatts (Standard) 2.5 KWatts (Intermediate) Estimated 50 – 500 Watts (Micro-repeaters)	40 KWatts
Proposed Antenna Patterns/Coverage Areas	Omnidirectional or Cardioid	Omnidirectional, Wide Cardioid (120 degrees) or Multiple Wide Cardioids
Number of RF Carriers	2	1

[1] XM in fact states "There is no need for power limits for repeaters other than reasonable limits for out-of-band emissions.", page 4, Supplemental Comments of XM Radio Inc., Dec. 17, 1999.

OOB Suppression	75 + 10log(P)	75 + 10log(P)
Maximum Quantity of Repeaters Allowed	Unlimited	Unlimited
Initial Quantity of Repeaters Proposed	1500 + Unlimited Micro-repeaters (150 High Power)	105 + Unlimited Low Power Units
Location	Urban Center of 70 Largest Cities	Urban Core of 46 Cities

(2) There is a high probability that DARS repeaters will be located in close proximity to MMDS/ITFS or WCS hub sites.

Obviously, the potential for interference from terrestrial DARS repeaters will depend largely on the number of terrestrial DARS repeaters that are installed, the EIRP levels of those repeaters, and their proximity to receivers installed for other services. Both XM and Sirius have represented to the Commission that the probability of DARS repeaters being located near MMDS/ITFS or WCS receivers is low.[2] In addition, XM has claimed there will be limited deployment of the high power repeaters (10 – 20 KWatts in EIRP) that pose the greatest threat of interference.[3]

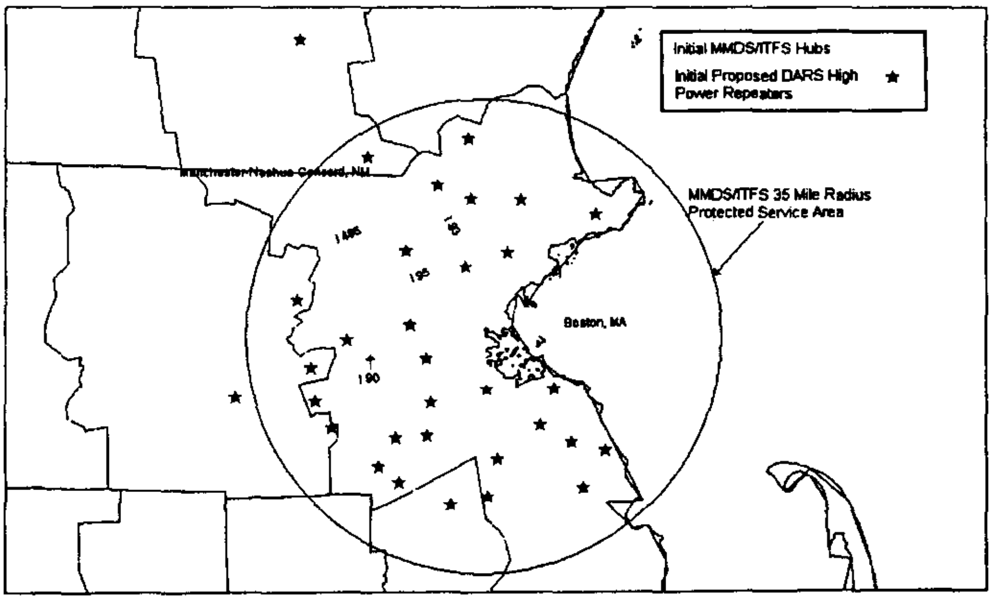
In considering the number of terrestrial repeaters of varying power levels that XM and Sirius intend to deploy, one must recognize that the numbers that they have cited in their filings with the Commission (and that are summarized above) are <u>initial</u> deployments only. It is significant that neither XM nor Sirius has evidenced any willingness to accept limitations or restrictions on the quantities, location or power levels of any terrestrial repeaters, and have provided the Commission with no information as to the number of terrestrial repeaters they intend to deploy.

Moreover, there is some ambiguity as to deployment plans. For example, XM stated in its Supplemental Comments and reiterated in its Consolidated Reply Comments that the total number of high power repeaters to be initially deployed around the country is 25. However, in information recently provided by XM to WCA for analysis, XM evidenced an intention to deploy in the Boston, MA

[2] "... satellite DARS terrestrial repeaters will be deployed primarily in urban areas, their coverage area will be unlike typical MDS services areas.", Reply Comments of Sirius Satellite Radio, page 12.

[3] "... XM Radio plans to deploy only a limited number of high-power repeaters in its DARS network ...", Consolidated Reply of XM Radio Inc., page 13.

area alone 32 repeater sites with power levels between 12 KWatts and 31.7 KWatts. These sites are plotted along with the initial MMDS/ITFS trial hub sites that have been deployed by a WorldCom subsidiary and the FCC granted 35 mile MMDS/ITFS protected service area in the figure below. The WCS service area extends throughout this region.[4] This map does not include any standard, intermediate or micro-repeaters XM may consider deploying, as this information was not provided. Also, there are no Sirius repeaters plotted on this map, as that



information has not been provided.

Several issues become very obvious from this map. First, the number of high power DARS repeaters to be deployed is significantly different from the numbers being discussed in front of the Commission. Again, it must be emphasized that the repeaters shown in this map represent only a portion of those proposed by XM (there are no standard, intermediate or micro-repeaters included) and there are no repeaters for Sirius shown. It seems reasonable that since the propagation and desired coverage areas for both DARS services are similar that an equal number of Sirius repeaters would be necessary. Likewise,

[4] Since WCS and MMDS/ITFS services are similar in coverage requirements, power limitations and service offerings, there is a high likelihood these transmitters and hub receivers will be located at or near the same sites. Several large MMDS operators (WorldCom and BellSouth) are also WCS licensees and will most definitely want to share tower locations for network efficiency and cost minimization.

because the XM and Sirius repeaters are so close in frequency the most economical way to achieve interference isolation between repeaters is to provide physical separation. Therefore, it is reasonable to assume the XM and Sirius repeaters will not be collocated and the number of DARS repeater sites will effectively double. These assumptions would place the number of high power repeaters in the Boston area alone at 64 with unknown numbers of lower power repeaters (many of which presumably would exceed the 400 watt/MHz limitation WCA has proposed).

Second, the location of the proposed high power repeaters is widely distributed throughout the WCS/MMDS/ITFS service area. These repeaters are not concentrated in the dense urban core but are in fact distributed along major thoroughfares and interstates. By spreading the DARS repeaters throughout the metropolitan area, XM significantly increases the potential for location near a receiver. In fact, one of the proposed DARS repeaters is located approximately 0.6 miles or 3110 feet from an existing MMDS/ITFS hub location. This DARS repeater will be located 550 feet above ground level and would have significant potential for unobstructed electrical path into the hub receiver of an MMDS/ITFS or collocated WCS service.[5] Other DARS repeater locations are in close proximity to the trial hubs shown on the map. Since this is only the beginning of the MMDS/ITFS deployment in the service area with only a small portion of the market being covered, the potential for location at or near a DARS locations will grow significantly.

In addition, the antenna patterns proposed by XM and Sirius range from ominidirectional to wide cardioids. With antenna heights based on the data provided by XM ranging from 110 to 720 feet above ground level, power levels between 12 – 31.7 KWatts and these broad antenna patterns, the DARS repeaters will literally blanket any MMDS/ITFS or WCS service operating in this same area. Because of the propagation characteristics at 2.3 GHz and with 12+ KWatts of power, the range of the DARS repeaters will be in excess of 20 miles with no terrain or clutter obstructions.

Metricom is the first WCS licensee to engage in a broad deployment of WCS facilities. Based on the deployment pattern of XM in Boston, it is evident that Metricom, who won the licenses rights for the A, C and D blocks in large

[5] It is worth noting that both Sirius and XM have failed to consider that both MMDS/ITFS and WCS services will have two distinct types of receivers. The first type of receiver will be located at each subscriber location and will receive the downstream transmissions from the central transmit site or hub. Likewise, each hub will have one or more receivers dependent upon the number of antenna sectors to receive the upstream transmissions from each subscriber. The hub receive systems will tend to have high antenna heights with patterns ranging from omnidirectional to as narrow as 30 degrees. Subscriber receive systems will tend to have a lower average height. However, if the service offering is directed at medium to small businesses for example, the average antenna heights will be higher. The antennas used by subscriber receive systems will range from low gain omnidirectional to very narrow in order to receive signals from distant transmit site locations.

areas of the country, has a high probability of being located in close proximity to DARS repeaters. Metricom's deployment strategy involves distribution of transceivers at numerous locations throughout its approved service areas. These units receive on WCS frequencies and then re-transmit on unlicensed frequencies to mobile and fixed wireless modems connected to customer's computers. Metricom's WCS receivers will be located on buildings, streetlight poles and other structures in urban areas of the markets where Metricom purchased WCS frequencies. Because they will be widely deployed, these receivers have a high probability of being in close proximity to a DARS repeater. In fact, one of the distribution strategies mentioned by XM for its micro-repeaters is on lampposts, which would perhaps result in collocation with Metricom's own lamppost installations.[6]

Therefore, based on information provided by DARS operators, the number of DARS repeaters to be deployed and the deployment strategy to be utilized, it is very reasonable and highly probable that DARS repeaters will commonly be located at or near MMDS/ITFS and WCS hub and customer premise receivers.

(3) The proposed operational configurations of the DARS repeaters will create conditions where antenna azimuthal, height and polarization discrimination will not be sufficient to eliminate interference to WCS hubs.

Because of the high probability that a DARS repeater will (1) be located physically close to a WCS hub or subscriber receiver; (2) will also be at potentially the same or nearly the same height and (3) will have coverage patterns that are wide spread throughout the same coverage area as a WCS service, the ability to rely on antenna discrimination to eliminate interference from terrestrial DARS repeaters is minimal. Height and azimuthal discrimination rely totally on the geometry of the two systems being different enough to allow the discrimination to work. As has been shown in the previous section, the geometry of the two services is very similar as are the coverage areas. Therefore, discrimination will be of little use.

In addition, discrimination is also a function of the size and directionality of the receive antenna. WCS systems have the ability to offer mobile and fixed services. Therefore, subscriber antenna patterns will range from omnidirectional to highly directional for installations long distances away from the transmit site. For WCS hub installations, the composite antenna patterns will almost always be omnidirectional even if this pattern is achieved by combining a series of directional antennas. Again, it is impossible to rely on antenna discrimination to control the amount of interfering signal coming from a DARS repeater.

Polarization discrimination is also not an option. As stated by XM and Sirius, DARS repeaters will utilize vertical polarization. WCS is allowed to utilize either vertical or horizontal polarization. In fact, because of the limited amount of

[6] Supplemental Comments of XM Radio Inc., Appendix A, page 5, paragraph 3.

spectrum available to a WCS operator, many of the system implementations will involve the use of cellular architectures. These architectures will require the use of both horizontal and vertical polarization in order to develop the frequency plans necessary to provide sufficient capacity for the desired service offerings. Therefore, it will be very likely that a vertically polarized WCS hub receive system will be located close to a vertically polarized DARS repeater. In fact, using the Metricom example where existing receivers are deployed in numerous locations around major metropolitan areas on streetlights, it is readily apparent that polarization will offer little protection to the system as a whole.

(4) Interference to MMDS/ITFS subscriber and hub receivers should not be a significant problem if a power limitation is placed on DARS repeaters.

To the extent that Sirius and XM contend that newer generations of MMDS/ITFS downconverters will reduce the risk of interference from satellite DARS, they are correct – with one important caveat. MMDS/ITFS operators are replacing older downconverters to eliminate interference from potential WCS transmissions and the additional filtering added to these units will filter out the DARS frequency band, as well as the WCS band. However, those filters have been designed solely to accommodate WCS transmissions of up to 2000 watts EIRP, as that is the maximum EIRP permitted under the Commission's rules. Signals of greater power will not be completely filtered by the new downconverters. This is precisely why WCA has called upon the Commission to protect MMDS/ITFS downconverters by adopting the same 400 watt/MHz EIRP limit on terrestrial DARS as has been imposed on WCS. In addition, as will be shown later in this document, a power limitation is essential to allow WCS operators the ability to protect their receivers from potential overload interference.

(5) A power limitation on terrestrial DARS repeaters is essential for WCS operators to be able to design filters to protect receivers from potential overload conditions and high order intermodulation distortion.

The proposed terrestrial DARS repeater frequencies are separated from the WCS C and D block frequencies by only 4 MHz on each side as shown in the following figure. In order for WCS receivers to prevent potential overload conditions with a DARS repeater operating at a 40 Kwatt EIRP in close proximity, a filter with at least 50 dB of attenuation at DARS frequencies would be necessary. A filter with this level of attenuation is impractical to use because of the cost and size.

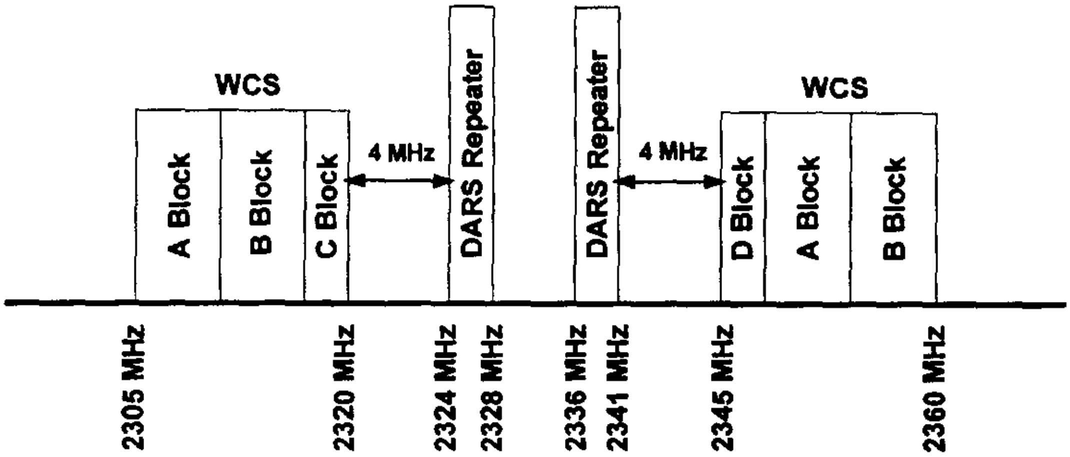


Figure 1 – Spectral separation between DARS Repeaters and WCS

Absent a limitation on the EIRP of DARS repeaters, the area surrounding each DARS repeater of potential interference to WCS receivers becomes extremely large. For example, the existing receiver used by Metricom has an overload point of –25 dBm at the input to the receiver. This is the level at which an interfering signal will cause unacceptable degradation to the BER of the WCS signal. The typical installation utilizes a small, economical receive antenna with a gain of 7dBi and a very broad beamwidth. Every Metricom WCS receiver located within 4,705 feet of a 12 KWatt DARS repeater would be vulnerable to interference. For a 40 KWatt DARS repeater, a Metricom WCS receiver would have to be 8,563 feet, or 1.6 miles, away to avoid interference. The following map shows the potential areas of interference for the proposed initial deployment of high-power DARS repeaters in the Boston area. The areas of potential interference are indicative of the power levels proposed by the DARS operator.

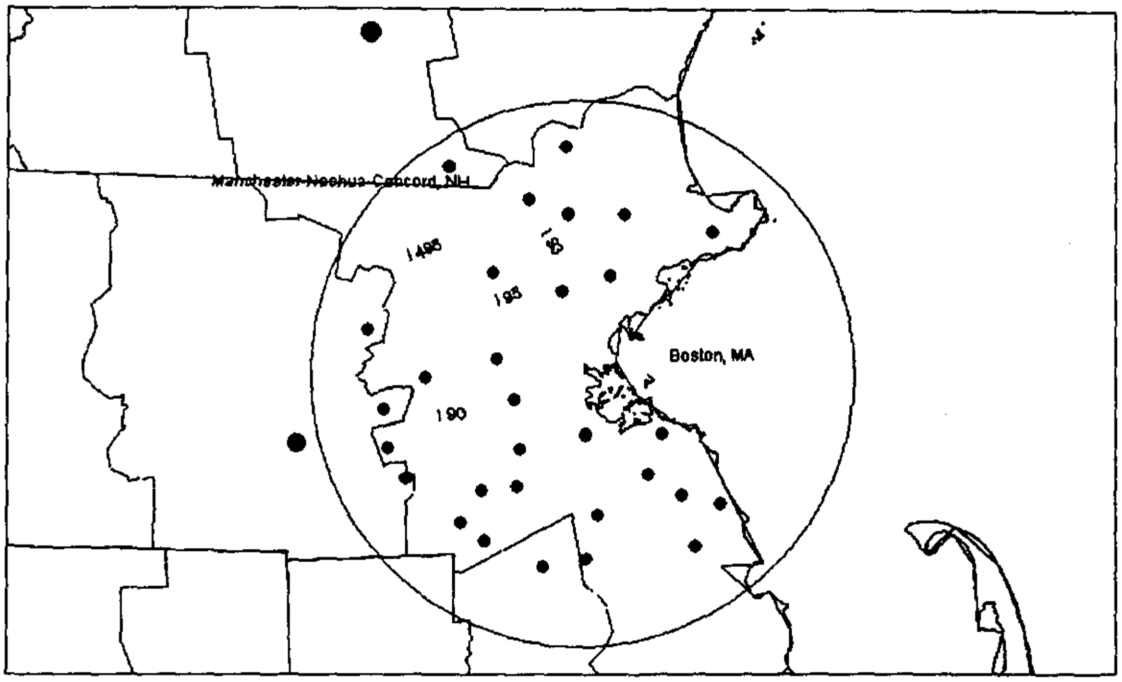


Figure 2 - Potential interference from initial DARS repeater deployment to WCS receivers

Of course, this map does not illustrate the potential interference from the XM lower-power repeaters or from Sirius' repeaters, as the number and location of these devices is unknown. Nor is any additional margin added into the equation for propagation anomalies. Moreover, the above areas of interference are representative for only one model of WCS receiver (Metricom), one which happens to have exceptional overload performance. Typical receivers will have input overload points between –25 and –35 dBm and will utilize various antenna gains. Under some common deployment scenarios, the interference areas shown above are expected to triple in size.

In order for the potential interference problem to be manageable, the area of interference should be 100 feet or less around each DARS repeater location. However, in order to control the potential for overload to within 100 feet of a 40 KWatt DARS repeater location, a filter with at least 50 dB of attenuation would have to be utilized. A quotation was obtained from a filter manufacturer for a filter that would provide at least 32 dB of attenuation at the worst case response point in the DARS repeater band. This filter would cost approximately $400 per receiver (in volume) and would be so large physically (2.5"H x 10"W x 6"L) as to make installations like the existing Metricom implementation impractical. Obviously, obtaining more attenuation than this was deemed even more impractical. Moreover, even if we assume use of the impractical and costly filter with 32 dB of attenuation and a WCS receiver input overload point between –25 to –35 dBm, any DARS repeater operating between 10 – 40 KWatts would cause overload to a WCS receiver located within 500 – 1000 feet of the repeater depending on the gain of the receive antenna.[7] Given the number of terrestrial DARS repeaters projected, the cumulative impact of this interference will not be insignificant.

If the DARS repeaters were limited to an EIRP of 400 Watts/MHz as are WCS operators, the potential for interference declines but in no way is eliminated. Again using the Metricom receiver as an example, a 2000 Watt DARS repeater will have to be located 1917 feet away from a WCS receiver (without the additional, cost- and size-prohibitive filtering) to not cause interference. In other words, Metricom will have to go to extreme measures to achieve the required isolation, even with a 2000 Watt limitation on DARS repeaters.

Likewise, intermodulation distortion caused by DARS repeaters is another issue of concern for the WCS receiver. The DARS repeater frequencies will mix with the WCS transmission frequencies to create higher order intermodulation distortion in the receive system. Attached is a chart prepared by BellSouth showing the portions of the WCS frequency spectrum that will be affected by 3rd and 5th order intermodulation distortion from the proposed DARS repeater frequencies. With no additional filtering in the WCS receivers, the potential for intermodulation distortion from nearby DARS repeaters is tremendous. This condition would apply to any DARS repeaters, whether they are high power or micro-repeaters. Both XM and Sirius have requested the ability to distribute unlimited numbers of micro-repeaters in "predominantly" urban areas to overcome building blockage or other obstructions to the satellite signals. These micro-repeaters will have significant potential for being located close to WCS receivers.

The only way WCS operators can protect themselves from the potential for intermodulation distortion caused by DARS repeaters is to (1) know the maximum power level a DARS repeater will generate and (2) have the maximum power level be limited to a low enough level to allow utilization of a practical filter design.

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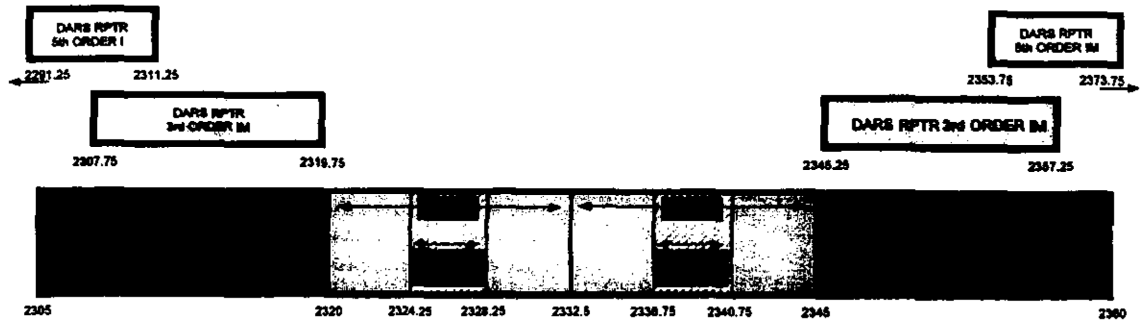
[7] Again, antenna and polarization discrimination cannot be considered based on the analysis presented earlier.



INTERMODULATION FROM DARS TERRESTRIAL REPEATERS INTO WCS BANDS

(5) There are no reasons for DARS repeaters to need more power than existing WCS or MMDS/ITFS services and should therefore be limited to 2000 Watts EIRP.

The propagation characteristics and coverage area requirements between MMDS/ITFS, WCS and DARS repeaters are virtually identical. The previous map of the Boston implementations proves this fact. WCS and MMDS/ITFS licensees have the potential to utilize omnidirectional receive antennas for mobile (WCS only) or portable services, can utilize modulation techniques similar to DARS repeaters or implement other services that may have propagation or reception characteristics similar to DARS implementations. The cost of these implementations in WCS and MMDS/ITFS frequencies will be affected by the 400 Watt/MHz EIRP restriction. However, WCS and MMDS/ITFS services have always felt this power limitation was reasonable in light of the need for interference protection between themselves and to other services. In addition, because of the excellent propagation characteristics and high reliability that can be achieved at these frequencies, operators believe this power level represents a reasonable tradeoff between interference and coverage concerns.

All existing designs of WCS equipment are based on having 400 Watt/MHz WCS neighbors. It is unreasonable at this point in time to expect existing WCS equipment that has been developed and deployed, such as the Metricom equipment, to be faced with the prospect of dealing with unlimited power levels from a neighboring service. In addition, for WCS equipment vendors to design equipment to handle DARS repeaters with power levels as are currently proposed would represent an unworkable cost and implementation scenario as has been shown previously. Installing filters that do not completely solve the interference problem and alone cost $400 or more at all WCS subscriber locations is unreasonable. XM complains in its Consolidated Reply Comments that restricting the power to 2000 Watts will cost them $45 million for additional repeaters. If we multiply the potential WCS subscriber base of several million (conservative) by $400 per installation, the $45 million suggested by XM is miniscule compared to the burden on WCS operators. Therefore, it is reasonable to restrict DARS repeaters to the same power levels imposed on other services in this frequency region.

This engineering statement was prepared by George W. Harter, Director of Broadband Wireless Engineering for MSI. All studies presented in this paper were prepared by me or under my direction and are true and accurate to the best

/s/

George W. Harter

Dated: December 11, 2000

ATTACHMENT D

Engineering Statement of George W. Harter.

Engineering Statement of George W. Harter

Introduction

This statement is prepared on behalf of BellSouth Entertainment Systems ("BES"), a WCS license holder, in response to certain issues raised by the SDARS licensees regarding the use of in-band terrestrial repeaters.

Propagation Model

In a meeting held on March 1, 2001 engineers representing the SDARS licensees, WCS licensees and WCAI industry association met to discuss the issues regarding potential interference between SDARS terrestrial repeaters and WCS receivers. In this meeting it was revealed that the SDARS engineers were analyzing potential interference to WCS receivers based on (1) receive antenna heights very near ground level (<10' AGL) and (2) the dB Planner software package. The dB Planner software was configured to utilize a propagation model developed by the Canadian Research Center ("CRC".) This model incorporated the use of clutter data in making coverage calculations.

In this same meeting it was clearly explained to the SDARS engineers that utilization of these receive antenna heights and this propagation model were not appropriate for analyzing interference to fixed wireless systems like those planned for the WCS band. First, it should be intuitively obvious that fixed wireless system antenna heights can and will be significantly greater than ground level. Fixed wireless antenna heights can vary significantly depending on the size of the home or building where the antenna is mounted. In addition, WCS antennas may even be mounted in trees as is the case in many MDS/ITFS installations. Information has been provided in ex parte filings by WCS operators participating in this proceeding showing the range of heights experienced in current systems. Since many of the technologies currently utilized by WCS operators require line-of-sight (LOS) conditions, achieving the maximum possible height at a receive site is very desirable. Since the SDARS repeater sites are proposing heights at or above current WCS transmission sites, it is very reasonable and prudent to assume that a large number of WCS receive sites will have LOS to SDARS repeater sites.

Second, since the WCS receive sites will have LOS conditions to SDARS repeater sites, the appropriate propagation model to be used is a free-space model. The CRC model incorporates the use of clutter in order to allow a potential operator to generate a less conservative look at coverage from a wireless system. This will allow the operator to estimate worst case conditions in determining the number of base stations needed to provide coverage to an area. However, when running interference calculations to other wireless systems